NOV 17 1941


# Gas Journal

LIGHT - HEAT - POWER - BY-PRODUCTS

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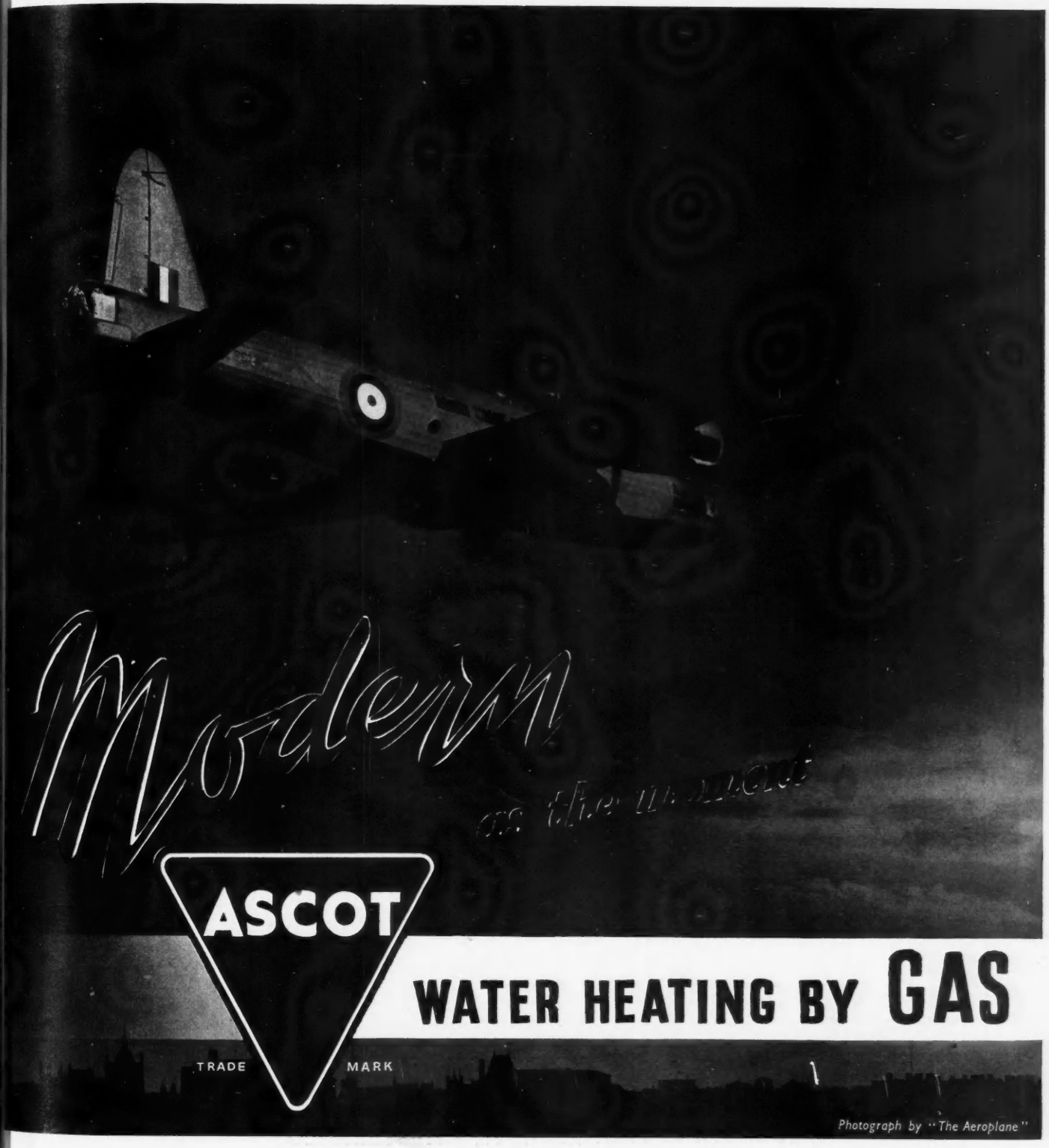

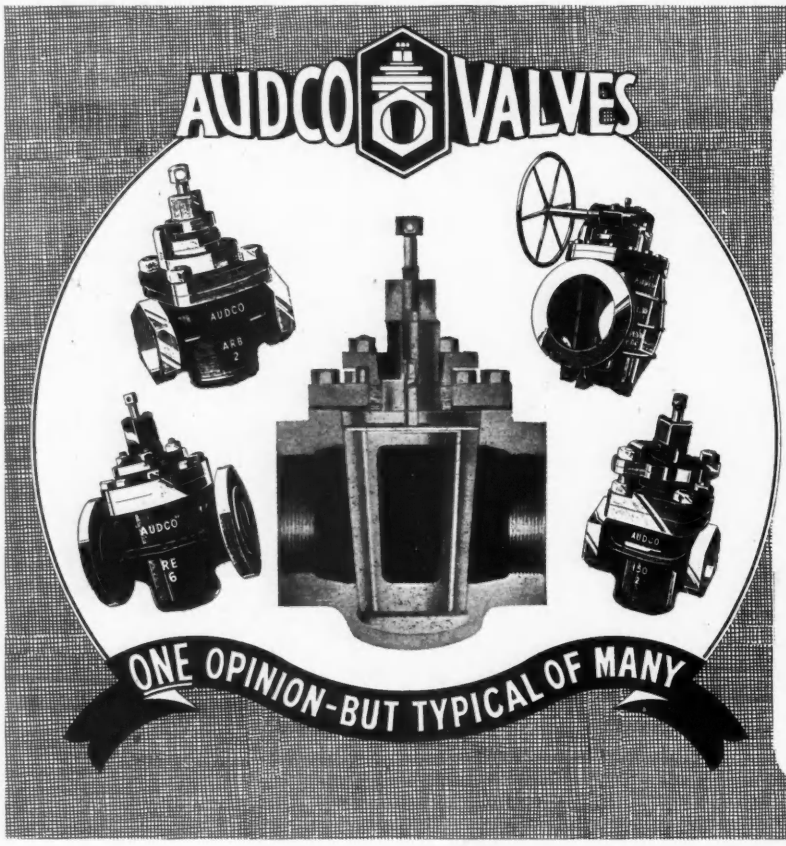


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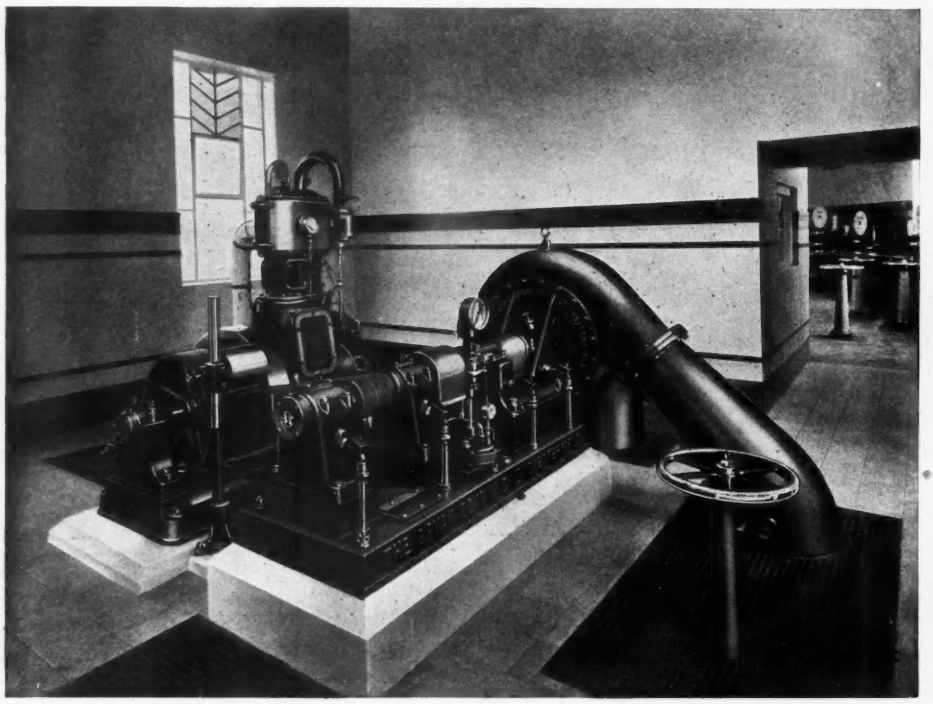

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Fig. 907.—Rateau Turbo Booster driven by a Vertical High Speed Steam Engine through "V" Ropes.

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**Gas Works Plant Engineers, CHESTERFIELD**

MEMBERS OF THE SOCIETY OF BRITISH GAS INDUSTRIES

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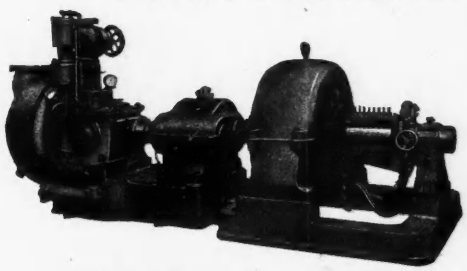

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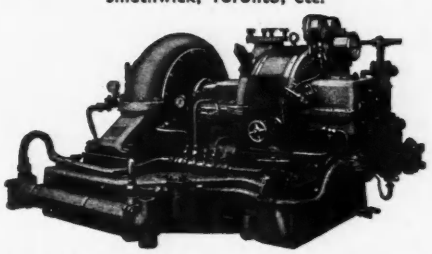

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For internal soundness Correct
Other defects —
Date of Mdr. 1867
Witness my hand.
Wm Taylor
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TESTING FEE, £— 1— —
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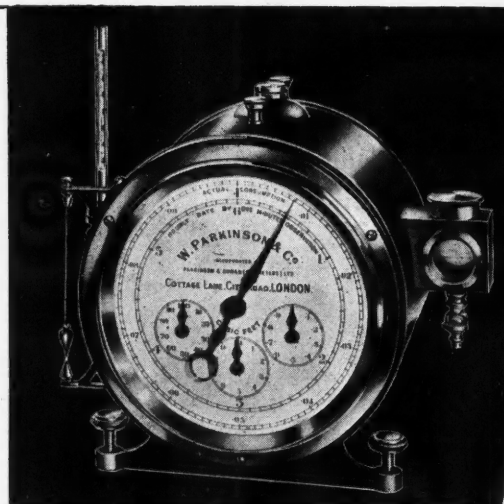


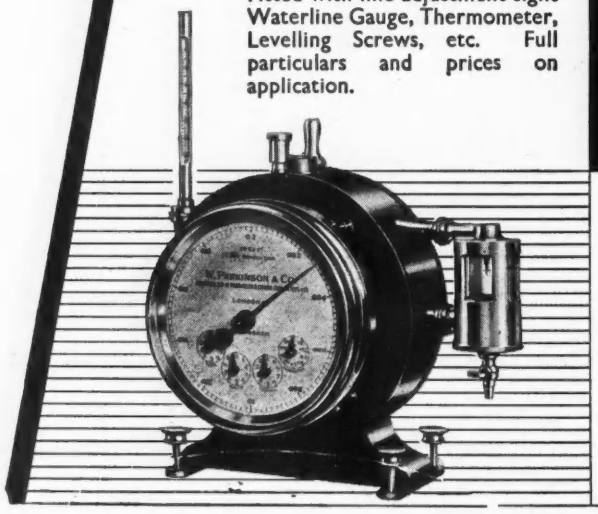

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THE SOCIETY OF BRITISH GAS INDUSTRIES 1905

P. 4

# GAS JOURNAL, OCT. 15, 1941

VOL. 236 93rd YEAR No. 4091


## EDITORIAL NOTES

### COKE ORGANIZATION

THE first annual report of the National Federation of Gas Coke Associations, which we published in the "JOURNAL" of Oct. 1, shows clearly enough how well organized this section of the Industry is becoming, and how fitted the producers of gas coke are to deal with all manner of problems as they arise and to speak authoritatively with united voice. The keynote of this body, formed at the beginning of 1939, is co-operation and co-ordination. Technical research, publicity and propaganda, market development and price regulation, and co-operation with other associations interested in the production, supply, or use of fuel in general and coke in particular come within its ambit, and the organization covers the whole of Great Britain. The outbreak of war followed so closely the formation of the Federation that its work has for the most part been done under wartime conditions. There is no doubt at all that this work has benefited greatly its members and individual undertakings, and much of it, notably the co-ordination of coke prices and the working arrangements with the hard coke producers, will have post-war benefits. The Federation very rightly points out in its report that wartime conditions have proved the need for effective co-ordination; post-war conditions will find that need emphasized when supplies of all smokeless fuels become readily available. The strength of the organization, of course, depends directly on the support given to it by its members, and the support which can be given by them depends in turn on the active part played by each individual undertaking. For full measure of success 100% membership is needed.

In the same issue of the "JOURNAL" we announced the completion of the arrangements for the organization of the coke oven industry with a view to ensuring the maximum possible effort of that industry in helping in the prosecution of the war. We welcome the formation of the British Hard Coke Association, representative of 98% of the total production of coke oven plants in the United Kingdom. The objects of the Association are succinctly stated as (*a*) to provide for the organization and development of the hard coke industry, and (*b*) to maintain and develop stable and satisfactory relations with organizations representing gas coke production and other related industries and interests. It is only by this form of inter-working and co-operation effectively applied that present and future problems will be solved.

### LIGHTING AND SAFETY

THE winter approaches, and with it, of course, the longer hours of blackout. Suggestions have been made that a trial should be given to the experiment of keeping the streets lighted until the approach of enemy aircraft is signalled; these have been rejected. In the House of Commons last Thursday the Home Secretary said that, apart from the fact that such a scheme would involve a considerable amount of work which could not be carried out rapidly under existing conditions, it would be likely to lead to an increase in road accidents from traffic which must continue to run after the lights had been suddenly extinguished.

There had been hopes that the present "starlight" lighting of the streets of central London and other cities might be modified. Regarding this the Home Secretary said the proposal that the streets should be lighted above the standard now permitted ignored the danger that by so doing they would give to the enemy a ready-made map of the area he might wish to bomb. We think, however, that attempts should be made to extend this "starlight" lighting, which is undoubtedly a very great boon indeed in the blackout—and a safety factor by no means to be ignored. In the first two years of the war nearly 18,500 people (actually 18,431, of which 10,000 were pedestrians) have been killed on the roads. This represents a very large percentage of the total fatalities due to enemy air raids, which number about 47,000. Every month in the second year of war has shown an increase in road deaths over the corresponding month of the first year, with one exception, when the decline, however, was only three. The pre-war average of deaths on the road was 6,500 a year. Then, of course, there is the serious question of the number injured; men, women, and children are sometimes crippled for life, and beds needed for war casualties have to be used for road victims. There is in being a new safety campaign.

The blackout is not regarded as having a major influence on the appalling number of casualties on the roads, but to our mind it must have a distinct bearing, both directly and indirectly in the sense that people may grow careless in their hurry to get home before the blackout. We have been interested in studying a summary of data collected by the Royal Society for the Prevention of Accidents (formerly the National "Safety First" Association). During the first twelve months of war 8,355 persons were killed on the roads. Of the pedestrians, 3,177 were killed during darkness, compared with 916 during daylight—more than three times as many. Accidents are more serious during the winter months. About half the fatalities occurred during the three months to December, 1940. The proportion of fatal accidents occurring during darkness has tended to increase steadily. In spite of the fact that people naturally avoid the use of the roads as far as possible during the blackout the proportion of night accidents reached an unprecedented value—as much as 80% of the total—during mid-winter, 1940.

In a recent bulletin the Royal Society for the Prevention of Accidents gave a most instructive diagram showing how valuable is moonlight, as compared with complete obscurity, to the pedestrian. The records of fewest accidents almost invariably coincide with a moonlight period, whereas all the high accident peaks are found during periods when there is no moon. In the moonless period at the end of 1940 (Dec. 17 to 31), marked by particularly dark nights, there was a greater number of fatal accidents than at any other time. The value of moonlight, thus demonstrated, is of great interest in showing the direct bearing of the presence of light, even if of weak intensity, in reducing the accident rate. It demonstrates the substantial value of wartime street lighting of low intensity. We urge its extended use.

### IMPROVED APPLIANCES

WE know that in certain directions development work, reduced from a peacetime to a wartime basis, is proceeding on gas appliances; we hope that it will be continued irrespective of the duration of the war. Indeed, the longer the war, the more important does it seem to us that this research and its application should go on. But it seems to us a pity that—to put it bluntly—the Gas Industry is not "making more of it." So much seems shrouded by the veil of non-publicity. Now we say this while fully recognizing that the laboratories and workshops of both gas undertakings and the manufacturers of plant and appliances are occupied in essential war work which has nothing whatever to do with the Industry's peacetime requirements. During recent months we have been afforded several opportunities of seeing for ourselves what is being done in various ways by gas undertakings and equipment manufacturers to further the war effort. We cannot, of course,

divulge what we have seen, but we can and feel we must say how remarkably the tools and machines normally on peacetime production have been switched over to armament production, and how usefully the accumulated knowledge, skill, and resourcefulness of all sections of the Gas Industry are being applied to processes wholly remote from those associated with peacetime conditions—an object lesson, in fact, of resiliency and reserve.

Yet, we would ask, would it not be wise for the Gas Industry to acquaint the public with at least something of what it is doing to meet their ordinary and future needs? We quote the following from the *Ironmonger*: "With the third winter of war imminent ironmongers and builders' merchants will once again approach the season's business in heating and lighting goods, grievously restricted in the scope of their opportunities. . . . Despite all hindrances the British manufacturer still reveals a mood of enterprise that augurs well for rapid recovery when peace comes again. New and improved appliances, although nothing like so plentiful as in former years, have made their appearance since last season, *especially in the electrical field*." The italics are ours. A special section of that particular issue of our contemporary dealt with heating and lighting. The only mention of gas was in a very brief paragraph (actually two sentences) relating to a gas poker. Yet our Industry surely has something more to offer than this in the heating and lighting field; and the market, even if diminished, does exist.

## A TIMELY ACTION

WE publish to-day something which is all too rare—an Author's own précis of a Paper he presented at a meeting of a gas association. The Author in question is Mr. J. Castle, of the Brighouse Gas Department, and his Paper was given to the Yorkshire Junior Gas Association this month. In peacetime we long urged authors to condense their contributions; the response was negligible, and the position—with so many meetings of so many associations—was, from our point of view, one of great difficulty. Even in those palmy days lengthy contributions were a matter of concern to us. Now, with severe wartime restrictions on paper, published contributions in the Press must be of condensed type, and it is obviously best for authors to prepare their own summaries. So we thank Mr. Castle for the step he has taken in this direction, and express the hope that his example will be followed; at the present stage concise contributions on a wide variety of subjects would to our mind be in the best interests of all concerned.

Mr. Castle's Paper dealt with practical and economic aspects of waste heat recovery on an existing horizontal retort setting—actually that at Brighouse; and the principal conclusion to be drawn from the investigation he described is that for a horizontal plant the criterion of temperature and carbon dioxide content in normal waste heat boiler practice is not necessarily applicable. The Author maintains that in the case of horizontal settings the aim should be to assess accurately the total amount of waste heat available for steam-raising purposes, without paying undue attention to the accepted standards of temperature and carbon dioxide requirements of the waste gases. With a knowledge of the probable steam yield from the setting, and the works requirements of steam (with an eye to the future likely output of the works), the rest is of a financial nature. The waste heat boiler at Brighouse has proved an investment which is paying good dividends; it is a success from both practical and financial aspects.

## Fuel Economy

At the present time naturally great importance is attached to the need for obtaining the maximum coal output. At the same time it is equally important to stress the vital importance of its efficient use; and in this regard the 1941 issue of the *Fuel Economy Review* should serve a useful purpose. This publication, for which the Federation of British Industries is responsible, places insistent emphasis on practical means of securing economies in the use of industrial coal by the adoption of methods which do not involve material expenditure and which can be applied forthwith to existing plant and appliances. A ton of coal saved, it is pointed out, is more than a ton of coal gained, when due account is taken of the consumption of coal, or of some equivalent form of energy, at the collieries themselves and of transport requirements. That the Gas Industry should come prominently into the picture in any review of fuel economy goes without saying. Among the several articles featured are those on the efficient working of gas producer plant and on the economical operation of gas-fired industrial plant. Technical developments in the gas and allied industries are summarized by Mr. H. D. Greenwood, and there is a useful contribution by Mr. R. A. A. Taylor on the storage of coal.

## Personal

The Distinguished Flying Cross has been awarded to Pilot Officer C. P. RUDLAND, R.A.F. Volunteer Reserve, who was born at Highgate in 1915 and served as a sergeant in the R.A.F. Volunteer Reserve before he was commissioned this year. Before the war Pilot Officer Rudland was a member of the Ascot staff at Southampton. He recently assumed command of his flight, and has performed exceptionally fine work in the course of offensive operations against the enemy, including a determined attack on an enemy aerodrome, a successful attack on a wireless station, and important operations carried out in the Cherbourg area. On one occasion he destroyed a Messerschmitt 109 which was taking off. On another occasion Pilot Officer Rudland displayed great coolness and courage when engaging and destroying one of a vastly superior number of enemy fighters. In August, 1941, while leading a section on an offensive operation, he attacked an enemy aerodrome at almost ground level. Pilot Officer Rudland has displayed a high standard of leadership and courage.

* * *

After 35 years' service Mr. C. H. WEBB retired on Sept. 30 from the position of Engineer and Manager of the Stourbridge Gas-Works.

At a meeting of the Stourbridge Town Council on Monday of last week a resolution was passed expressing appreciation of his long and exceptionally capable services.

Mr. Webb, it was mentioned, went to Stourbridge from Stockport, where the output of the local gas-works was 18 million cu.ft. per month, or less than half the present output.

In thanking the Council Mr. Webb said much of the success achieved had been due to the completeness of the trust which had been placed in him.

* * *

Sir ERNEST BENN has resigned his position as Chairman of Benn Brothers, Ltd., publishers of our contemporary, the *Gas World*, and other trade journals, to devote more attention to the United Kingdom Provident Institution, of which he has also been Chairman since 1934. His successor at Bouverie House is Mr. Gordon Robbins, who has been Deputy Chairman for 14 years. Sir Ernest retains his seat on the Board and will act in a general advisory capacity.

* * *

The employees of the Horncastle (Lincs.) Urban Council Gas-Works have presented a companion set to Mr. T. W. DODDS and Mrs. DODDS on the retirement of Mr. Dodds from the post of Manager of the Gas-Works. Mr. H. Allbones, the senior member of the staff, made the presentation.

## Obituary

### An Appreciation of the late E. P. Stevenson

The knowledge of the passing of my former chief came as a very sad shock to me. I had the great privilege of serving under him in Buenos Aires in the reorganization of the Primitiva Gas Company during the years 1925, 1926, and 1927, during which time I shared his house, his family joys, and his business worries. Many a game of tennis and billiards we played together; many a romp I have had with his charming children, and many an evening have I spent listening enthralled to his renderings of opera on his "to and fro" (accordion) accompanied by his great musical friend, Sr. Ponsati.

His talents as a gas engineer and administrator were given full play in the reorganization of the Primitiva Gas Company. In the period mentioned shares rose from 6s. to 15s. and gas-making cost was reduced from 7.7 cents to 4.4 cents a cu.m. Nearly every piece of plant on the extensive works of the Company was overhauled, together with the mains and piping serving them. A centralization scheme involving the enlarging of the Corrales Works from 3 million cu.ft. per day to 8 million cu.ft. per day was carried out, and a projected development to 13 million cu.ft. per day provided for. The closing-down of three other works; the modernising of district works and repair shops; the curing of a complicated distribution system suffering from chronic naphthalene "arthritis"; and the regaining of the goodwill of the consumers, long resigned to bad pressure, smelly gas, and frequent stoppages—all were accomplished in this short time under his able management.

What pleasant recollections I am continually recalling, week in, week out, more especially in these darker days when in reality those others were so much brighter, pleasanter, friendlier, and so much more absorbingly interesting. Days he made by his personal interest, guidance, help, gratitude, patience, and charming friendship, such as I would gladly re-live.

Learned, charming, generous, and genuine, he built structures of benefit to the populations he served on both sides of his life's road, and planted around them the seeds of the flower of genuine affection, which shall be a lasting memorial to him.

"SNIP" STREDWICK.

## London Juniors

A meeting of the London and Southern District Junior Gas Association was held at the Westminster Technical Institute on Oct. 3, when a Paper on "Post-War Planning and the Gas Industry" was read by Mr. E. O. Rose, of the Tottenham and District Gas Company. The President, Mr. F. O. Hawes, presided over a good attendance.

The Author dealt first with planning from the historical standpoint and showed how, during the last ten years, the necessity for planning has been gradually realized. The legislation dealing with planning was reviewed, and examples of planning by private enterprise were also given.

The situation arising from the war was discussed, and a forecast was made of the nature of the anticipated post-war national plan. The question of power supply was dealt with and the place of the Gas Industry in any future power plan was discussed.

Finally, the more personal topic of the status of the professional gas engineer in any planned economy and his fitness to fill the position required of him was dealt with.

The Discussion on the Paper, which in the early stages at least was largely political, showed the keen appreciation of the members in the trend of events and a determination to put new spirit into the Industry. It was argued that sectional interests would have to be subordinated, that planning had been delayed as a result of apathy, and that in the future the Juniors should have a greater voice in the affairs and policy of the Industry. It was urged that any planning should be based on the interests of the public, that regarding thermal efficiencies and the like a new approach was needed, and that electricity at ½d. a unit would displace gas at 10d. a therm. It was argued, too, that technicians must have a wider influence in the future Gas Industry, that the real place which gas could usefully occupy in its service to the community should be clearly defined, and that, though the Industry had in fact a "cast-iron case," it was badly placed psychologically. It was not an Industry which appealed to the ambitious young man, and that position should be changed; and, broadly, any idea of toleration should be altered to one of proper recognition.

We shall deal further with the Paper in a subsequent issue of the "JOURNAL."

## Gas Solves the Match Problem

An old idea—but one that is causing quite a stir and securing for the Newcastle & Gateshead Gas Company a considerable amount of goodwill—is a gas jet burning all day outside their Showrooms in Grainger Street, Newcastle. Hundreds of cigarette and pipe smokers passing by each day are overcoming the match difficulty by obtaining free lights.

"That's what I call service" remarked an Australian officer as he strolled away after lighting his pipe at the lighter.

An outdoor lamp by-pass is used for the flame, the tube of which is

inserted through a chromium-plated ash tray on stand, and is set mouth high for convenience. The stand and window near-by bear the invitation "Matches are scarce—Light your Cigarette or Pipe here —Gas Service."

Without invitation the *Daily Express*, *Daily Mirror*, *Daily Mail* and *Newcastle Evening Chronicle* photographers were soon on the spot to take photographs for their papers of this rather old but now novel wartime idea. News paragraphs in bold-faced type also appeared in the *Daily Sketch* and *News Chronicle* on this gas-lighter service for smokers.

**The London and Counties Coke Association** will hold the following meetings on Oct. 20, at Gas Industry House : Finance Committee, 10.45 a.m. ; Executive Committee, 11.15 a.m. ; Buffet Lunch, 12.30 p.m. ; Central Committee, 1.30 p.m.

## Coming of Age of Midland Tar Committee

The Midland Tar Co-Operative Scheme, which to-day comprises some 120 gas undertakings covering a large area of the Midlands and North Wales, has now been in existence for 21 years and, on Thursday, Oct. 2, to mark the occasion the Midland Tar Distillers, Ltd., entertained all the Members of the Midland Tar Committee at lunch at their Oldbury Works.

During the whole of this period of 21 years Alderman J. H. Lloyd has been the Chairman of the Committee, and after the lunch he was presented with a Georgian silver nutmeg-grater as a small token, to which all the Members of the Committee had subscribed.

Mr. Stanley Robinson, Charman of the Midland Tar Distillers, Ltd., made a short speech welcoming the guests on behalf of his Company. He said that most of the Distiller Members on the Committee were either at school or juniors in the laboratory when the Committee was formed, and the only original Distiller Member remaining was Mr. M. Macintosh Williams. He therefore thought it most appropriate that Mr. Williams should make the presentation to Alderman Lloyd.

In a speech full of interest Mr. Williams gave a brief history of the tar trade. He referred to the methods of fixing tar contracts in the early days, and gave some startling examples of high and low prices for tar products which he had known during his long experience. It was in order to get over these fluctuations that the late Mr. F. Kilpatrick and the late Mr. H. C. Head had conceived the idea of a profit-sharing scheme between gas undertakings and distillers in the South and South-West of England. He said that he thought the present generation of tar distillers and gas engineers did not always realize the debt owed to these two gentlemen.

He then outlined the negotiations which had led up to the formation of the Midland Tar Pool in 1921. Alderman Lloyd had been asked to take the Chair at the first Committee and he had continued to occupy that position ever since. He had proved to be an ideal Chairman, and he felt certain that the happy relations which existed between the Gas Members and the Distiller Members on the Midland Tar Committee were due in no small measure to their good fortune in having such a Chairman.

In replying Alderman Lloyd thanked Mr. Williams and Mr. Stanley Robinson for the kind things they had said about him. He said that he had followed the fortunes of the tar trade with great interest during the 21 years of his Chairmanship, and he was particularly interested in the work of the British Road Tar Association. He felt it was a great honour that he had been asked to act as Vice-President of this Association, and he was particularly pleased that Mr. W. J. Hadfield had been appointed Chairman of the British Road Tar Association, as he had long experience as a Surveyor and so was able to appreciate the views of the users of the products.

Mr. A. W. Smith, of the City of Birmingham Gas Department, on behalf of the Gas Members of the Committee, thanked the Distillers for their hospitality and added his tribute to Alderman Lloyd.

Before the gathering broke up Alderman Lloyd announced that that was the last occasion on which he would appear as Chairman of the Midland Tar Committee. He said that he was now 86 years of age, and he felt sure that the time had come for him to retire. He had felt this for some little time, and it was, perhaps, in some ways fitting that he was able to announce his intention on this occasion.

**Candidates** for the 1942 Associate-Membership examination of the Institution of Chemical Engineers must lodge their applications by Dec. 15. Application forms and particulars, together with a memorandum on "The Training of a Chemical Engineer," are now obtainable from the offices of the Institution at 56, Victoria Street, London, S.W. 1.

**Mr. Thomas Wilson,** one of three Glasgow Councillors convicted at the High Court in Edinburgh last month of having solicited or received bribes in connexion with a gas-works contract, died in Edinburgh Royal Infirmary on Oct. 6. He was Convener of the Gas Committee until his forfeiture of office as town councillor last month.

**General Control** over warehouse rates and charges other than those of statutory bodies is to be exercised by the Board of Trade, through the Control of Factory and Storage Premises and the Central Price Regulation Committee. Where possible, rates will be fixed by agreement between the Control and the wharfingers and warehousekeepers' organizations, failing which the Board will fix regionally by Order the rates and margins which may be levied by warehouse undertakings. No increase on existing rates may be made without the sanction of the Board of Trade.

**The next Meeting** of the Members of the Fuel Luncheon Club will be held in the Connaught Rooms, Great Queen Street, Kingsway, W.C. 2, on Wednesday, Oct. 22, at 12.40 for 1.10 p.m., when Lt.-Col. W. A. Bristow, M.I.E.E., will install Sir David Milne-Watson, Bart., LL.D., as President of the Club for the coming year. After installation Sir David Milne-Watson will give his Presidential Address entitled, "Fuel and the Future." The cost of the Luncheon to non-members will be 7s. exclusive of gratuities and liquid refreshments. Any such visitor wishing to be present is asked to forward his remittance of 7s. to the Secretary of the Club, when a ticket will be sent to him. This ticket must be given up to the waiter at the Luncheon and no refunds can be allowed.

# THE AIMS AND FUNCTIONS OF PUBLICITY

## 2. THE GAS INDUSTRY'S PARTICULAR PROBLEM

**The second of a series of articles on various aspects of publicity specially contributed to the "Gas Journal" by the British Commercial Gas Association. The first article appeared in the "Journal" of Sept. 24, p. 474.]**

THERE are some general principles of advertising which apply all round, but every concern has problems of its own which are not identical in nature with those of any other. Mentioning some of the Gas Industry's will make the aims of the advertising easier to see.

### Advertising Gas

Most goods are advertised directly. Think of a few slogans: "Beer is Best," "Stick to Beer," "Tea Revives you," "A Cup of Cocoa is a Cup of Food." If you should be stirred to action, you can act without any difficulty and get beer, tea, or cocoa at any time the law permits. You could not act on a slogan announcing the merits of gas, however, deeply it influenced you, unless you possessed the necessary gas appliances. "Gas is Great" might become quite a celebrated slogan if enough money were spent in making it well known, but by itself it would never sell any gas. Day to day sales of gas are only made because people need it for certain specific purposes. There are few people outside the Industry who know or care whether gas is the best agent in the world for all kinds of heating and lighting or not. There are millions who prefer a gas cooker to any other, comfort themselves with gas fires and water heaters (in reason let us hope at the present time), and know, if they do not own, many other conveniences which work by gas.

The sale of gas depends directly on the sale of gas appliances, and so the Gas Industry's advertising cannot afford to concentrate on gas as something admirable in itself; if it can take care of the sales of the appliances they will take care of the sales of gas. In the same way, the reputation of the Gas Industry as a whole is closely tied up with the performance of individual cookers, gas fires, gas pokers, water heaters, and so on. The better all these become the higher goes the reputation of gas, and the more effectively they are advertised the more popular gas itself becomes.

### The Fashionable Appeal

It would be dangerous, however, to leave the Gas Industry to find its level in the hearts of its countrymen and women on its own unsung merits. When gas lighting was first started, poets broke into song and the invention was widely accepted as one of the most miraculous benefactions of science. After a period, however, gas steadily lost glamour, and it would be foolish not to face the fact that there was a tendency to regard it as frowsy and out of date. Remember the powerful influence that women have on the sale of gas. You could probably rely on engineers to pick the most efficient fuel for a job. You would not expect women, or many men for that matter, to use something dowdy and unfashionable in their homes, however high its calorific efficiency. Many old-established firms reach this problem some time in their history. One of the most spectacular cases was that of Jaeger, long famous as makers of astoundingly healthy weather-proof, and almost battleproof, clothing. Towards the end of the last century rich elderly invalids almost invariably wore Jaeger. Stevenson has a description of one in *The Wrong Box*. There was a firm with a product held in the highest esteem, genuinely recommended by doctors, and selling less and less every day as the old customers grew older, died, and were not replaced.

Jaeger is some distance from gas, but its story amounts to a classic or leading case in the advertising business. Suddenly the whole range of Jaeger clothing was re-designed to dashing models for smart women, and at the same time the advertising turned from a recital of worthy virtues to light and ecstatic prose in the style of a "bright young thing," to use the technical phrase then current. Illustrations were in the same vein and the firm, having given up the ancient goodwill which was holding it back, started on what is nearly an entirely new life.

One of the Gas Industry's problems has been similar, with an extra complication—very dangerous and direct competition. Electricity offers its services for nearly all the same purposes as gas. Whether it is as efficient or not is beside the point; people do think of it as modern and glamorous without any prompting. One of the chief tasks of gas advertising is to keep housewives convinced that gas is the choice of the modern woman. Think of it this way. The old style, black cast-iron cookers cooked extremely well, but there are many housewives who would not have them in their kitchens at the point of a gun—simply because of their appearance. The modern style cookers in gay colours and bright enamel are attractive to look at, and fit into the newest kitchen. They cook as well as the old, or a little better, but they are far more popular because they look up to date. The Industry and its products are up to date and advertising has to keep the public informed that they are.

It is the fate of large businesses to be viewed with a certain natural lack of affection by those whom they serve. Men and women are particularly resentful of those which provide them with necessities. Citizens who would walk miles to return a penny they had been overpaid, defraud railway companies with a feeling almost of virtue. This is partly because the big public utility companies are to some extent non-competitive. To make some journeys other than by rail is difficult and uncomfortable; a user of gas or electricity cannot change from either easily if he feels he has a grievance. Deep-rooted is an unexpressed feeling that some goods or services should be as free to everyone as air. People sub-consciously struggle against the feeling that concerns supplying them with goods are their masters and not their servants. Bills arrive regularly and impersonally, and whereas the unwilling debtor can change his tradesman and so obtain supplies of many other necessities or luxuries, the gas company, electricity company, or railway can cut him off at the source. There are many roots to this feeling of antagonism interesting to explore. Ultimately, of course, it can only be broken down by the actual conduct of the Industry and its servants. Advertising must help to emphasize the human and friendly side of what could be thought an impersonal machine.

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## Complete Gas Kitchen and Canteen for Munition Workers

A new canteen was opened recently to provide meals—breakfasts, dinners and teas—for the workers in a munition factory in the North-West. The work of planning and equipping the kitchen was entrusted to Radiation Ltd., the result being shown in the accompanying photograph. The equipment installed included: 1 Three-oven No. 757 Chester range, 2 roasting ovens, 1 Wardour fish fryer, 1 Savoy griller, 1 D.C. steamer, 2 30-gallon Lune boilers, 2 8-ft. Belgravia hotclosets

butted together to form centre of service counter, 1 two-tier cabinet hotcloset, 2 water boilers for tea making. In addition the contract included the provision of domestic hot water supply, tables, shelves, refrigerators, labour-saving machines, sinks, and the supply of cutlery, crockery, and all kitchen utensils. Ventilating hoods were made and installed, being supported from the floor on tubular pillars, one of which has been used to convey the main gas supply to the cooking apparatus. Continuous shift working in the factory requires that meals be constantly available. The kitchen is designed to cater for 450 meals at one sitting.

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## Lead Pipes

The revision of the British Standard for Lead Pipes has just been undertaken and is known as B.S. 603–1941 Lead Pipes (B.N.F. Ternary Alloy (No. 2)). This specification was first issued in May, 1935, but as a result of experience gained in its use it was found that certain modifications were desirable, and these have been incorporated in the revision now published.

The main points in this revision are as follows:

(*a*) The chemical composition is now given in greater detail, and so in the method of marking.

(*b*) An additional clause has been included with regard to grain size.

(*c*) The ranges of pressure for which the various weights of pipe may be used have been modified; restrictions are also placed on the pressures in pipes used to carry hot water.

Copies of this specification (No. 603–1941) may be obtained from the British Standards Institution, 28, Victoria Street, London, S.W. 1, price 2s. (2s. 3d. post free).

# ASPECTS OF WASTE HEAT RECOVERY*

By J. CASTLE, B.Sc., Brighouse Gas Department

THE Paper, of which this is a précis, was an account of investigations made into the possibility of raising steam from the waste gases of the setting of existing horizontal retorts at Brighouse Corporation Gas-Works.

The carbonizing bench consisted of 7 beds of 10 Drakes 20-ft. through retorts over regenerators, with a dummy arch prepared for extension to 8 beds.

The existing steam-raising plant consisted of two 30 ft. by 8 ft. Lancashire boilers each of which was capable of providing the whole of the steam requirements of the works amounting to approximately 60,000 lb./day. The working pressure was 80 lb. per sq. in. and the boilers were not fitted with either superheaters or economizers. One of these boilers having been condemned, the question arose as to whether to replace it with a similar boiler or a waste heat boiler.

The object of the investigation was to discover whether a waste heat boiler would generate all the steam requirements of the works for all or part of the year, and, if so, whether the installation would be a success financially.

Using the basic formula :

$$C \text{ plus } (O_2 \text{ plus } 4N_2) — CO_2 \text{ plus } 4N_2,$$

with variations for different amounts of excess air present, a table was constructed showing the weights of the separate constituents in the flue products for varying percentages of $CO_2$ per 1 lb. of coke supplied to the producers.

To arrive at these figures it was necessary to determine experimentally (*a*) what weight of water was evaporated from the firebars per 1 lb. of coke fired to the producers, (*b*) what percentage of the coke supplies was actually carbon taking part in the reactions to form producer gas.

Using factors from *Technical Data on Fuel*, it was then possible from this table to compile a table showing the total sensible heat in the flue gases at different temperatures and $CO_2$ contents per 1 lb. of coke to the producers.

This table was then plotted graphically, and it was used to determine the amount of steam which could be generated per day, given the weight of coke used in the producers, and the $CO_2$ content and temperature of the waste gases, assuming these to be cooled down to 250°C. in a waste heat boiler.

## Experimental Results

The first experimental results showed considerable air leakage, and a short account of the methods taken to reduce this to a minimum is given. Tests of the $CO_2$ content and temperature of the waste gases were taken, from which it was possible to derive by means of the graph the total steam yield per day under various conditions of working of the setting.

From the average results obtained from the data collected, the next stage was to find a method of assessing the steam yield per day throughout the year from a knowledge of the working of the settings only. To do this it was necessary to evaluate the effect on the steam yield from the setting of (*a*) one bed on 24-hour charges, (*b*) one bed on 12-hour charges, (*c*) one non-working bed. The collected data gave the anticipated steam yield for certain fixed conditions, and by manipulation of equations expressing these conditions, the following values were obtained:

EFFECT OF STEAM YIELD FROM SETTING.

| | | | |
|---|---|---|---|
| One bed on | 12-hour charges | plus | 24,500 lb. steam per day. |
| " " | 24- " " | " " | 9,400 " " " |
| " non-working bed | | minus | 11,600 " " " |

These figures only apply when considering the complete setting, and assuming the flue gases to be cooled down to 250°C. in a waste heat boiler.

Using these values, a table showing the record of the working of the setting for the previous 12 months was made. This table showed the potential daily steam yield side by side with a record of the actual steam demand throughout this period, allowance being made for the extra steam demand due to the steam drive of the waste gas extraction fan. These figures were plotted graphically, and revealed that while it would not be possible to generate the whole of the steam requirements of the works throughout the year, it would be possible to do so from October to April inclusive.

## Economic Considerations

The economic side involved three main financial considerations:

(1) The release of a considerable amount of coke and breeze previously fired to the Lancashire boiler.

(2) Labour.

(3) The provision of a suitable boiler feed water.

It was estimated that during the period in which the waste heat boiler was working a total of approximately 1,000 tons of coke and breeze worth £500 would be released.

Regarding labour, the output of the works was expanding such that for a short period during each winter it would be necessary to provide an extra stoker per shift for work in the retort house. The provision of a waste heat boiler would obviate this by allowing the stoker who fired the Lancashire boiler to devote the whole of his time to the retort house.

The feed water used on the Lancashire boiler was unsuitable for a waste heat boiler, for which treated town water would be used at a considerably higher cost.

Taken together, it was estimated that there would be an annual financial advantage of £530 on an additional capital expenditure of £1,000, this being the extra cost of a waste heat boiler over that of a replacement Lancashire boiler. A waste heat boiler was subsequently ordered, and particulars of the specification and guarantees were given together with a brief description of the erection of the boiler in a difficult position.

On test the boiler evaporated 2.94 lb. of water per 1 lb. of fuel to the producers, and was up to expectations in every other respect.

## Working Results

Working results for the two years 1938–39 and 1939–40 are given, and these show that the estimates of the performance and financial aspects were readily fulfilled. The following table gives average results obtained during the first season together with the estimated results using the evaluation of the setting referred to earlier.

| 12-hour beds. | 24-hour beds. | Flue gases. %$CO_2$. | Flue gases. Temp.(°C.) | Coke/day producers (lb.) | lb. steam/ day actual. | lb. steam/ lb. coke actual. | lb.steam/ day estimate. |
|---|---|---|---|---|---|---|---|
| 3 | 1 | 7.75 | 480 | 20,200 | 49,200 | 2.43 | 48,100 |
| 4 | — | 8.0 | 500 | 25,100 | 65,300 | 2.60 | 63,200 |
| 4 | 1 | 8.5 | 520 | 29,600 | 79,300 | 2.68 | 84,200 |
| 5 | — | 9.25 | 560 | 33,700 | 94,800 | 2.81 | 99,300 |
| 5 | 1 | 11.25 | 650 | 38,000 | 116,600 | 3.06 | 120,300 |

The extra cost of the boiler amounted to £1,200, and the saving on the first year totalled £493. Since then the boiler has successfully been operated on treated stream water and this has resulted in a further substantial saving. In addition the saving on retort house labour has been considerable, and together with the rising value of coke, the annual saving for the second year of operation, 1939–40, amounted to £767.

Perhaps the principal conclusion to be drawn from the Paper is that for a horizontal setting the accepted criterion of $CO_2$ content and temperature of the waste gases is not necessarily applicable. In the case under review, the $CO_2$ content was invariably less than 9% and the temperature of the waste gases below 600°C. While it is not suggested that these figures could not be improved upon, the point is made that there must be many works with horizontal settings where a waste heat boiler would prove to be a practical and economic proposition.

* Author's Abstract of a Paper to the Yorkshire Junior Gas Association.

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## Industrial Canteen Association

Palatable food in comfortable surroundings is to be the watchword of a new association recently formed in the North Staffordshire area. At a meeting in the Showrooms of the Stoke-on-Trent Gas Department, representatives from many firms resolved to create an Industrial Canteen Association. The scheme is to have official backing to the fullest extent. H.M. Inspector of Factories, Mr. T. Dymock, addressed the meeting and expressed his interest in the plan, emphasizing the importance of canteens and the provision of substantial, properly cooked meals. He thought that there had been considerable improvements in canteen and feeding arrangements in factories, but while every firm could do something on its own, it was largely a matter of trial and error. If all would join together and pool experience the errors could be eliminated to the benefit of all, and he congratulated the Gas Department on bringing forward the project and affording facilities for meetings. Mr. Irving Greenwood, Sales Manager to Stoke-on-Trent Gas Department, outlined the suggested scheme for the Association. He said that difficulties that confronted canteen managements were often the result of inexperience and could be quickly overcome if a central organization were available. A committee was appointed with Mr. Greenwood as Secretary.

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**The City of Durham Gas Company** recently co-operated with the local Citizen's Advice Bureau in a special publicity campaign. During one week an Advice Centre was opened in the Gas Company's showrooms and special window displays and advertising were featured to attract public attention. The campaign was highly successful, and a considerable number of people took advantage of the facilities. The Company recently turned to account the present match shortage by installing in front of their showrooms a gas cigarette and pipe lighter. The novelty of the idea aroused much local interest and the appliance was made use of to a considerable degree. Other undertakings in the neighbourhood were not slow to realize the goodwill possibilities behind the project and themselves followed Durham's example.

# MANUFACTURE OF AMMONIUM CHLORIDE FROM GAS LIQUOR*

By ROWLAND WALKER and H. C. APPLEBEE, A.I.C.,
Manchester Gas Department

UNTIL comparatively recent years the manufacture of sulphate of ammonia represented for the majority of gas-works the only outlet for the ammonia production, but there were those in the Industry who realized that there were other possibilities. For example, the late Mr. J. G. Newbigging, then the Chief Engineer of the Manchester Corporation Gas Department, in the course of his Presidential Address to the Manchester District Institution of Gas Engineers, Feb. 28, 1914) said, "It is questionable if it is the best policy to convert all the ammonia produced in gas-works into sulphate, and whether a portion of it should not be converted into other ammonia products, such as ammonium chloride and liquid ammonia. It has been proved that a considerably increased revenue can be obtained for the latter product by cultivating a local sale for household purposes."

The changed conditions of the ammonia market in subsequent years have given added point to such views, and economic pressure has forced on the Gas Industry the necessity for close study of the possibilities of other outlets for ammonia.

These notes give a brief review of some additional reasons, as they apply at the Partington Works of the Manchester Corporation Gas Department, for the adoption of a process for the manufacture of ammonium chloride, and give also some description of the process itself and its results. Whether the adoption of similar methods by other gas-works would be justified is for each to determine, but the writers feel most strongly that, at least as far as the Partington Works is concerned, the process has been amply justified by the results.

It is, of course, well known that in gas liquor by far the greater part of the fixed ammonia is present as chloride, the actual amount varying primarily with the chlorine content of the coal carbonized. It is also well known that as condensation proceeds from hydraulic main or collecting main, through foul main to condensers, there is a progressive decrease in the ratio of fixed to free ammonia. At Partington semi-direct recovery is practised, and so there is not complete condensation as in ordinary gas-works practice; nor are there either ammonia washers or scrubbers. The general statement, however, remains true. The figures given in Tables I and II will serve to illustrate this point.

From time to time attempts have been made to recover the ammonium chloride directly from a portion of the ammoniacal liquor, with certain evident advantages. No external supply of acid is needed. The distillation of the remaining liquor, since it would contain only free ammonia, would not require the use of lime. That there are other advantages we hope to make clear later.

The first experiments with which the writers have personal acquaintance were made in 1914 at the Bradford Road Works of the Manchester Corporation Gas Department. In these experiments liquor was drawn off from the hydraulic mains (of the horizontal settings) and evaporated in an open lead-lined pan, using a closed steam coil. Difficulties of evaporation and pressure of other matters (the last war having broken out) led to the abandonment of these experiments, which, however, had served to indicate the possibility of some such process.

So far the matter had been approached solely from the point of view of the recovery of the ammonium chloride, but with the opening of the Partington Works of the Manchester Corporation Gas Department a new aspect was introduced.

It may be recalled that in order to deal with the effluent, primarily from the sulphate of ammonia plant, the dephe olating plant had been erected. As may be seen by reference to the Paper given before The Institution of Gas Engineers (Communication No. 29) in 1931, by Mr. A. L. Holton (until recently the Chief Engineer of the Manchester Corporation Gas Department), it was found that, as had been anticipated, the removal of the monohydric phenols was very efficient. But the removal of the polyhydric phenols ("higher tar acids") was less so, owing to their lower solubility in benzole, and the removal became less and less efficient as the series ascended.

It was thought, and confirmed by experiments, that the liquor condensed in the early part of the condensing system would contain not only the bulk of the fixed ammonia, but also a great proportion of the higher tar acids. Hence a scheme for the separation of, say, the first 5 gallons of condensed liquor per ton of coal carbonized would open up not only the possibility of recovering the ammonium chloride, but would also bring about a substantial reduction in the oxygen-absorption figure of the effluent liquor. The typical analyses (given in Table III) bear out these views. (In works making concentrated liquor the removal of these higher tar acids is of assistance in dealing with the problem of "colour" development in the concentrate.)

As a result of these considerations a complete plant for the recovery of the ammonium chloride from the first five gallons of liquor, by circulation in a closed system and subsequent evaporation, was put into operation in June, 1932. The essential features of the plant are as follows: The liquor from the hydraulic main of the horizontal retorts, the collecting mains of the vertical retorts and the foul mains is collected and circulated, by pumping, through the foul main of the vertical retort installation. The circulation is continued until the concentration reaches about 10% ammonium chloride, when it is withdrawn for evaporation and crystallization. Although concentration may be carried much further if desired, see Table IV, it is found that 10% is a convenient strength for the subsequent treatment.

The original evaporating plant was of the cascade type, the liquor flowing downwards through two parallel series of 25 pans each, the pans being made of silicon-iron. The heat for the evaporation of the liquor was supplied by the combustion of producer gas (from the Trefois producers) with two Gako burners at the front providing two-thirds of the total heat and the remaining one-third by auxiliary burners at the sides. The liquor leaving the bottom of the cascade entered a crystallizing box and on cooling deposited the crystals of ammonium chloride. These crystals were then "fished" from the box and placed on a draining table. As even after prolonged draining the moisture content of the salt was somewhat high, various methods

(*Continued on p. 103*)

TABLE I.—TESTS ON SAMPLES OF AMMONIACAL LIQUOR TAKEN AT BRADFORD ROAD WORKS.

| Carbonization system. | Horizontal House ("B") | | | Vertical House ("C") | | | Vertical House ("D") | | |
|---|---|---|---|---|---|---|---|---|---|
| Sample from | Hydraulic Main | Condensers | Scrubbers | Hydraulic Main | Condensers | Scrubbers | Hydraulic Main | Condensers | Scrubbers |
| *Analysis gm./*100 c.c. | | | | | | | | | |
| Ammonia Free | 0.74 | 2.90 | 2.06 | 0.21 | 1.40 | 1.97 | 0.22 | 1.07 | 1.43 |
| ,, Fixed | 0.62 | 0.22 | 0.08 | 0.91 | 0.16 | 0.13 | 0.83 | 0.10 | 0.04 |
| ,, Total | 1.36 | 3.12 | 2.14 | 1.12 | 1.56 | 2.10 | 1.05 | 1.17 | 1.47 |
| Carbonates as $CO_2$ | 0.86 | 3.55 | 2.99 | 0.16 | 1.58 | 3.23 | 0.12 | 1.23 | 2.37 |
| Sulphides as $H_2S$ | 0.061 | 0.444 | 0.280 | 0.085 | 0.234 | 0.189 | 0.007 | 0.185 | 0.144 |
| Cyanides as HCN | 0.006 | 0.059 | 0.045 | 0.005 | 0.021 | 0.036 | 0.003 | 0.026 | 0.032 |
| Phenols as $C_6H_5OH$ | 0.313 | 0.303 | 0.016 | 0.287 | 0.313 | 0.060 | 0.276 | 0.345 | 0.085 |
| Thiocyanates as CNS | 0.097 | 0.055 | 0.152 | 0.010 | 0.064 | 0.365 | 0.043 | 0.023 | 0.066 |
| Thiosulphates as S | 0.058 | 0.022 | 0.016 | 0.016 | 0.029 | 0.032 | 0.016 | 0.016 | 0.016 |
| *O/A pts./*100,000 | | | | | | | | | |
| Due to phenols | 557 | 539 | 28 | 511 | 557 | 107 | 491 | 614 | 151 |
| ,, thiocyanates | 80 | 45 | 126 | 8 | 53 | 302 | 36 | 19 | 55 |
| ,, thiosulphates | 50 | 19 | 14 | 14 | 25 | 27 | 14 | 14 | 14 |
| ,, other forms (higher tar acids, &c.) | 531 | 289 | 64 | 1103 | 415 | 176 | 1057 | 743 | 150 |
| Total (found) | 1,268 | 892 | 232 | 1,636 | 1,050 | 612 | 1,598 | 1,390 | 370 |

TABLE II.—ANALYSES OF AMMONIACAL LIQUOR AT THE PARTINGTON WORKS.

| Sample from— | Ammonia free. | Ammonia fixed. | Ammonia total. | Oxygen absorbed (4 hr. at 27° C.) Total | Due to higher tar acids, &c. | Remarks. |
|---|---|---|---|---|---|---|
| | Gm./100 c.c. | | | Pts./100,000. | | |
| Retort house draining tank below governors | 0.272 | 0.830 | 1.102 | 1,490 | 458 | — |
| ,, ,, ,, ,, | 0.119 | 1.581 | 1.700 | 1,720 | 759 | — |
| Tar bosh at main inlet to condensers | 0.094 | 1.746 | 1.840 | 2,040 | 812 | — |
| Condenser—1st gas taker | 0.21 | 0.21 | 0.42 | 1,550 | 692 | Inlet temperature 82° C. |
| ,, 2nd ,, | 0.31 | 0.20 | 0.51 | 1,447 | 516 | ,, ,, 68° C. |
| ,, 3rd ,, | 1.11 | 0.11 | 1.22 | 1,307 | 32 | ,, ,, 60° C. |
| | | | | | | Outlet ,, 32° C. |

* Paper to the Manchester and District Junior Gas Association.

of drying were tried, and finally a centrifugal machine was introduced, by means of which the moisture content is reduced to reasonable limits.

The cascade system of evaporation, however, proved itself to be inefficient, objectionable, and expensive. The heating efficiency was only of the order of 30%, making the cost of heating unduly high. Owing to the low dissociation temperature of ammonium chloride either solid or in solution, the fumes from the pans were apt to be excessive, and being corrosive were most undesirable both in themselves and in their effects on the plant and on neighbouring ironwork. Breakages of the pans were frequent and the costs of repairs and maintenance were excessive.

In 1937 it was decided to install an evaporator of the vacuum type. This well-known type of evaporating plant offers the advantages of higher efficiency of evaporation, while at the lowered temperatures prevailing dissociation and hence corrosion are reduced to a minimum. No fumes escape into the atmosphere.

TABLE III.—Typical Analyses of Liquor Before and After Separation of the First Five Gallons/Ton.

| | Before | | After | |
|---|---|---|---|---|
| | Gm./100 c.c. | O/A Pts./100,000 | Gm./100 c.c. | O/A Pts./100,000 |
| Ammonia Free ... ... | 0.61 | — | 0.68 | — |
| ,, Fixed ... ... | 0.49 | — | 0.14 | — |
| ,, Total ... ... | 1.10 | — | 0.82 | — |
| Sulphide as $H_2S$ ... | 0.0174 | — | 0.050 | — |
| Ferrocyanide ... ... ... | Traces | — | — | — |
| Phenols as $C_6H_5OH$ ... | 0.470 | 837 | 0.460 | 819 |
| Thiocyanates as CNS ... | 0.020 | 17 | 0.054 | 45 |
| Thiosulphates as S ... | 0.0194 | 17 | 0.040 | 32 |
| O/A due to higher tar acids, &c. | — | 494 | — | 194 |
| O/A total (found) ... ... | — | 1,365 | — | 1,090 |

TABLE IV.—Liquor Withdrawn after Circulation of First Five Gallons.

| | Gm./100 c.c. | O/A Pts./100,000 |
|---|---|---|
| Ammonia Free ... ... ... ... ... ... | 0.1 | — |
| ,, Fixed ... ... ... ... ... ... | 8.76 | — |
| ,, Total ... ... ... ... ... ... | 8.86 | — |
| Chloride as HCl ... ... ... ... ... | 18.89 | — |
| Sulphide as $H_2S$ ... ... ... ... ... | 0.006 | — |
| Cyanide as HCN ... ... ... ... ... | 0.016 | — |
| Sulphates as $SO_4$ ... ... ... ... ... | 0.08 | — |
| Phenols as $C_6H_5OH$ ... ... ... ... ... | 0.75 | 1,335 |
| Thiocyanates as CNS ... ... ... ... ... | 0.04 | 33 |
| Thiosulphates as S ... ... ... ... ... | 0.079 | 67.6 |
| O/A due to higher tar acids, &c. ... ... ... | — | 384.4 |
| O/A total (found) ... ... ... ... ... | — | 1,820.0 |

TABLE V.—Costs of Production Per Ton of Ammonium Chloride.

| Period | Average for 3 years ended 31.iii.38 | Year ended 31.iii.39 | Year ended 31.iii.40 | Year ended 31.iii.41 |
|---|---|---|---|---|
| Production (tons) | 73 | 195 | 217 | 185 |
| Type of evaporator | Cascade | Vacuum | Vacuum | Vacuum |
| | £ s. d. | £ s. d. | £ s. d. | £ s. d. |
| Process wages | 1 10 2.20 | 1 3 0.92 | 1 0 11.06 | 1 3 4.22 |
| Steam, &c. (a) | 3 5 10.43 | 1 3 9.54 | 1 2 8.08 | 1 10 5.84 |
| Repairs and maintenance | 2 10 4.40 | 8 11.08 | 9 2.60 | 1 9 0.97 |
| Sundry charges | 1 6.72 | 1 11.38 | 1 1.27 | 11.67 |
| Provision for renewals | 18 1.98 | 1 2 1.85 | 19 10.89 | 1 3 4.21 |
| Cost of production | 8 6 1.73 | 3 19 10.77 | 3 13 9.90 | 5 7 2.91 |
| Gross income (less loading and delivery) | 6 6 7.23 | 7 7 7.08 | 7 15 0.27 | 9 0 11.67 |
| Net income or loss | 1 19 6.50 | 3 7 8.31 | 4 1 2.37 | 3 13 8.76 |

Note.—(a) Producer gas.

The plant, which was designed by Messrs. W. C. Holmes & Co., Ltd., of Huddersfield, to the requirements of the Manchester Corporation Gas Department, consists of a double effect vacuum evaporator (by Geo. Scott & Son (London), Ltd.). A working vacuum of 27 in. to 29 in. mercury is maintained by a steam-driven engine, in conjunction with a surface condenser. The plant is capable of evaporating 150 gallons per hour and provision is made for continuous operation by means of a vacuum box.

The corrosive character of the liquor necessitates the use of corrosion-resisting materials in the construction of the plant, and the materials used are as follows: The bodies of the evaporators are of cast iron of 3 ft. internal diameter, fitted with stainless steel tube plates into which are expanded 78 by 2 in. and 2 by 4 in. special nichrome steel tubes. The more important valves are of Audcolloy and have proved to be very satisfactory.

The centrifugal is of the suspended overdriven swan-neck type with perforated vulcanized steel cage, 36 in. diameter, with central bottom discharge. The outer casing is vulcanite lined and the spindle on which the basket is carried is also vulcanite covered.

The cost of the plant was £2,846 with a further £650 for the centrifugal. The condenser had been adapted from a spare condenser which was no longer in use for its original purpose, but was found to be inadequate and it was replaced in July, 1940, by a specially designed condenser at a cost of £250. In addition two sets of spare tubes for the evaporators were purchased at a cost of £560.

The plant has proved to be much more satisfactory than was the old cascade evaporator and is operated throughout, at the present time, by female labour. It is free from nuisance, since there are no fumes and both running costs and the cost of repairs and maintenance have been lowered. The spare tubes to which reference has been made have not in fact been used and the plant is still working with the original tubes. The steam consumption is about 1,180 lb. per hour.

A comparison of the costs of production for the two plants (cascade and vacuum) is given in Table V.

The average test of the products (for the year 1940) is as follows:

| | |
|---|---|
| Moisture ... ... ... | 4.3% |
| Ammonium chloride ... | 94.6%—98.85% on dry basis |
| Ammonium sulphate ... | 0.2% |
| Insoluble matter ... | 0.5% |
| Undetermined ... ... | 0.4% |

When fresh the colour of the salt is good, but it rapidly darkens on exposure to air, owing to the presence of higher tar acids, which are, of course, easily oxidized and give rise to colour-producing bodies.

The presence of these higher tar acids (mainly catechol) in the liquor raises some interesting points. It has already been stated that the withdrawal of the first portion of the liquor has the effect of lowering the O/A figure of the liquor subsequently condensed. This is due to the fact that the higher tar acids are to some extent concentrated in the liquor withdrawn from circulation. Since the O/A figure of the higher tar acids is high in relation to that of the monohydric phenols themselves, the reduction in O/A figure due to their removal is greater than their proportional quantity represents.

Not all of the higher tar acids present are removed with the ammonium chloride crystals, and in fact a considerable proportion remains in solution in the mother liquor, and the amount increases as the mother liquor is re-worked. Samples of mother liquor have been tested in which the higher tar acid content—expressed as catechol — has amounted to as much as 25%. In order to keep the concentration of higher tar acids down to reasonable limits, a portion of the mother liquor is systematically rejected. The rejected mother liquor also contains a substantial amount of thiocyanate—another body with high oxygen-absorbing capacity.

Many attempts have been made to improve the colour of the salt. It is not difficult to do so in the laboratory, but so far no practicable method of doing so on the plant scale has been found. It may be of interest to indicate the lines of approach to the problem which have been tried.

There are certain well-known solvents for the higher tar acids—for example, ether. Benzene is not successful, but mixtures of benzene with aniline or quinoline do give some improvement. Other solvents have been suggested, as, for example, pyridine and tri-cresyl phosphate. But, in our case at least, there are serious objections and difficulties in applying such processes, apart from the question of cost.

Removal of the higher tar acids by chemical methods has also been proposed. Catechol, for example, may be precipitated from solutions by lead carbonate. Iron salts may be used to form compounds with the colouring matters present in the liquor, and these compounds in turn may be removed by liquor containing sulphuretted hydrogen and subsequent flocculation and filtration.

With regard to the rejected mother-liquor, attempts have been made to find a market for it (selling on its catechol content), but so far without success. It seems that there is no simple method of separating the catechol from the other organic substances which are present.

For the time being, then, the problem of improving the colour of the ammonium chloride remains unsolved, as is the associated problem of recovering the catechol, from the mother liquor or otherwise.

A further point of interest may be found in the following circumstances. On the body of the evaporators there are inspection glasses and from time to time breakage of these glasses has occurred, apparently due to corrosion rather than to ordinary fractures. Investigation by Mr. Albinson (the Chief Chemist at Partington) has established that the corrosion is due to fluorine. It is not generally appreciated that coal may contain noticeable quantities of fluorine as well as chlorine.

In conclusion we suggest that the process outlined represents a development in gas-works practice offering substantial advantages in the profitable recovery of ammonium chloride, an improvement in the quality of the general liquor with an improvement of the effluent from the works, in the saving of time in the distillation of liquor and in a reduction of the difficulties in the manufacture of concentrated liquor.

## Discussion

Mr. **Allen** (Partington) opened the discussion by stating that since he had been in charge of the plant during the past nine months he was pleased to confirm that there had not been the slightest trouble in operating it. At the present time it was being operated by women.

Mr. **W. Hodkinson** (U.K.) said the Paper afforded some indication of the developments which were taking place in the Gas Industry. It would appear that The Institution of Gas Engineers had only one object in view—namely, complete gasification, so as to produce a cheap therm. He was not sure that this was the right line. Some research work on problems such as that investigated at Partington might be advisable. Allowing for capital charges, there appeared be a net profit of 14% on the process. The receipts for the year ended March 31, 1941—*viz.*, £9 0s. 11.67d.—appeared to be a swollen figure.

Mr. **Walker,** in reply, stated that the rising price obtained for the ammonium chloride appeared to be due to the present market conditions, which had been affected by the exigencies of the war. It was difficult to say what would be the effect on the market if there were a substantial increase in production, but presumably the law of supply and demand would operate.

Mr. **Albinson** (Partington) stated that any system of purification would almost inevitably involve sublimation which, in its turn, would involve a 100% increase in the cost of both capital and labour.

# En passant

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*Shakespeare (Richard II).*

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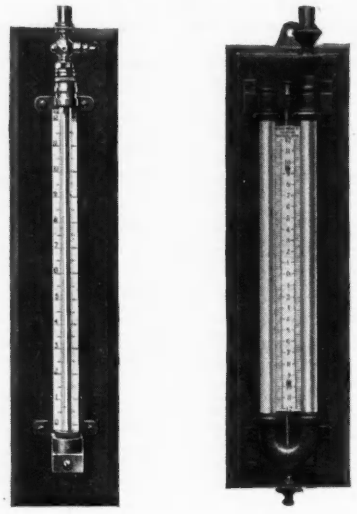

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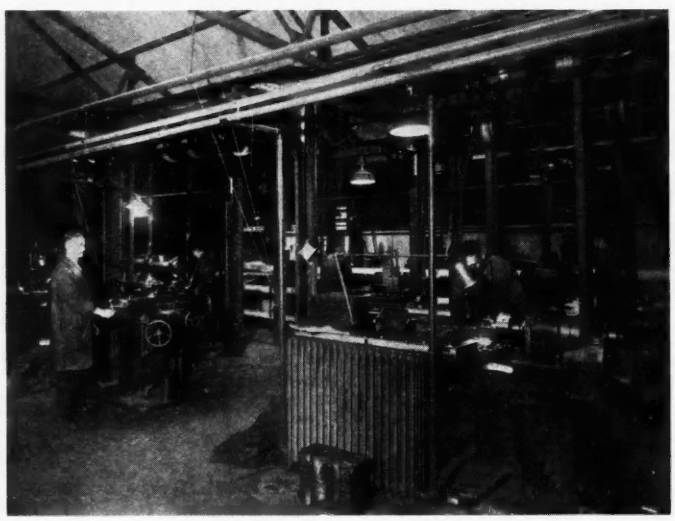

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At the present time the product was in demand because of its low price. So far as he could see, it would be disastrous, from Manchester's point of view, if every gas-works commenced to produce ammonium chloride. With regard to the disposal of the mother liquor, it was destroyed by mixing with ashes. It amounted to approximately one ton per month.

Mr. **Walker**, in reply to a question as to whether the process could be adopted by any system of carbonization, said it could, stating that concentration could be effected up to 10%. The liquor was put into the foul mains in order to utilize the higher temperature of the collecting mains for dehydrating the tar.

Mr. **C. Cooper** (Huddersfield) mentioned that the evaporation of fixed ammonia liquors of this character was a problem which had only been solved after considerable experimenting on a working scale. The original experiments began in cast-iron vessels, but at an early stage a change-over was made on to corrosion-resisting steels, and a working scale plant on a coke oven installation was operated for some fifteen months before failure of the heating tubes took place. The cause of failure was variously attributed to the presence of fluorine, to simple corrosion by chlorides, and to a special form of corrosion which was known to take place under conditions of high stress. In the next plant constructed for this purpose, measures were taken to eliminate stress as much as possible, and also the material of the tubes was made considerably stronger. The excellent life of the tubes at Partington proved that this problem had been solved, and the life reported, some three years, was considerably greater than was guaranteed when the installation was projected. The presence of fluorine was undoubted, and it was interesting to note that on another installation where lime was allowed to come in contact with the liquor, the heating tubes of the evaporator became coated with a scale of calcium fluoride, and this at one time was supposed to act in a protective manner. However, the fact now appeared that even without such protection an economical life could be obtained for the heating tubes if the vessels were correctly designed. In regard to the possible market for ammonium chloride of this quality, it appeared that the total market prior to the war was for some 4,000 tons per annum, represented chiefly by the dry battery trade and certain other commercial channels of consumption. The crude ammonium chloride used for galvanizing work, &c., appeared to be derived from a different method of recovery.

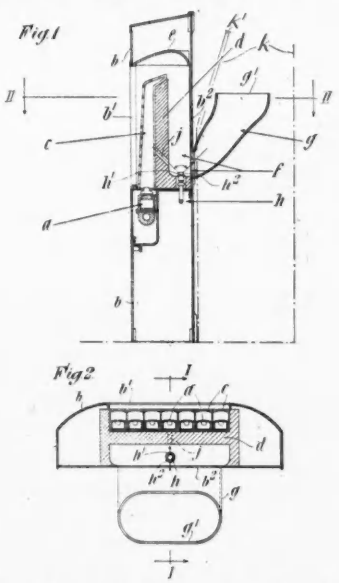
# NEW PATENTS

## Gas Fires

A new gas fire patent (No. 539,114; application date, Feb. 22, 1940) has been taken out by the Newcastle-upon-Tyne and Gateshead Gas Company and J. E. White.

This invention comprises an enclosing casing supporting one or more vertical radiants at a level wholly or mainly above its midway height, an upstanding refractory panel behind the radiants, a passage for the products of combustion from the radiants immediately over the panel, an unobstructed downward passage behind the panel with an outlet adjacent to the level of the lower end of the panel, and means for creating negative pressure in the outlet to ensure the required discharge of the combustion products into the chimney or flue.

Fig. 1 is a sectional elevation on the line I—I in fig. 2, and fig. 2 is a sectional plan on the line II—II in fig. 1.




Referring to the drawings, in the example therein illustrated the burners *a* of the fire are supported by an enclosing casing *b* at a level well above that of the hearth of the domestic fireplace (indicated in dot-and-dash lines in fig. 1) to which the gas fire is to be fitted, the level of the hearth being that of the bottom of the casing. The casing *b* is provided with a frontal opening $b^1$, and the combustion of the flames from the burners *a* takes place within a number of vertical radiants *c* in the customary manner, the radiants facing the opening $b^1$ and being disposed side by side above the burners *a* and immediately in front of an upstanding refractory panel *d* within the casing *b*. The panel *d* is preferably composed of high temperature insulating refractory material and is of H-section as shown in fig. 2.

The hot products of combustion, on leaving the radiants *c* are led over the top of the panel *d*, which co-acts with an arched portion *e* of the casing *b* to make a passage as shown in fig. 1, and down between the panel and the rear wall $b^2$ of the casing to a flue outlet *f* which is provided at a level only slightly above that of the burners *a*, the outlet opening into an upwardly-flared draught inducer *g* which fits within the existing chimney-flue opening *k* of the domestic or like grate and is attached to the rear wall $b^2$ of the enclosing casing of the gas fire. The existing canopy indicated at $k^1$ of the domestic or like fireplace is accommodated between the inducer *g* and the rear wall $b^2$.

The area of the upper discharge end $g^1$ of the draught inducer is greater than the area of its lower end adjacent to the flue outlet *f*, thereby tending to create a negative pressure in the outlet which ensures the steady flow of the hot combustion products over the weir formed by the upstanding refractory panel *d*. To start the flow on lighting the gas fire, there may be provided behind the panel *d* and centrally of the outlet *f* a supplementary burner *h* provided with two orifices $h^1$ $h^2$ which emit jets of gas in divergent directions, the smaller of the jets, $h^1$, being projected up an inclined hole *j* in the panel *d* so that, on the burners *a* of the fire being lit, the flame travels therefrom through the hole *j* and ignites the jets of the supplementary burner *h*. The larger jet, $h^2$, of the latter is projected into the draught inducer *g*, and the heat thus generated assists the operation of the inducer. The burner *h* is supplied with gas through a thermostatically-controlled by-pass (not shown) in a well-known manner so that, when the products of combustion in the passage behind the refractory panel *d* attain a temperature sufficiently high to operate the thermostat, the gas supply to the burners *h* is automatically cut-off thereby and remains cut-off until the fire is once more cold. There is thus no waste of gas while the fire is burning.

The refractory panel *d* may consist of a single moulded piece as illustrated, or it may be made up in two or more pieces to facilitate construction.

The elevated gas fire described is designed to heat up rapidly from cold, and is characterized by the position of its flue outlet *f* which is behind its refractory panel *d* and slightly above the level of its burners *a*.

## Discharge Doors for Vertical Retorts

Among the new patents is one (No. 539013; application date, May 14, 1940) by the Woodall-Duckham Companies and G. J. Jackson relating to improvements in liquid-sealed discharge doors. It is principally intended for use in conjunction with the known type of water-sealed discharge door provided at the lower end of a Woodall-Duckham continuously-operating vertical retort. The door assembly comprises an arcuate segmental door rotatable about a horizontal axis below the retort outlet, which latter is formed by side and end members co-acting with the upper surface of the door. Below the door are two boxes fitted one within the other forming between them an annular trough containing water, the inner box forming a passage for material discharged from the retort. In the closed position the edges of the door dip beneath the surface of the water in the trough, and the door is opened by rotating it so that the door enters and is immersed in the trough on one side of the outlet, the outlet of the retort then communicating directly with the passage through the inner box for the discharge of material from the retort.

With liquid-sealed doors of this type it is found that there is sometimes a tendency for dust or small-sized material to escape over the upper surface of the door into the liquid in the trough. This is in part due to material being carried round on the upper surface of the door below the co-acting edge of the retort outlet (which does not bear directly on the upper surface of the door) into the liquid when the door is opened. The liquid is consequently fouled, and the trough requires frequent cleaning-out.

Moreover, small-sized material may lodge or be forced between the lower edge of the side member and the upper surface of the door, causing wear to the door and/or to the side member, and consequently enlarging further the gap between the side member and the door.

It is the object of this patent to provide a simple and effective means of overcoming these difficulties.

According to the invention, in a liquid-sealed door of the kind specified, there is provided a scraper bar resiliently pressed against the upper cylindrical surface of the door and mounted in or on that side member of the outlet which is above the trough wherein the door is immersed when open, the scraper bar operating to impede the passage of dust or small-sized material from above the door into the liquid in the trough during the opening of the door.

According to a further feature of the invention, two scraper bars are arranged in or on each of the two opposite side members of the outlet, parallel to the axis of rotation of the door, and each scraper bar is resiliently pressed against the upper cylindrical surface of the door, one scraper bar operating to impede the passage of dust or small-sized material from above the door into the liquid in the trough during the opening of the door, and the other scraper bar operating in the same manner during the closing of the door.

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# Gas Products Prices

### The London Market

Oct. 13.

Prices of Coal Tar Products in the London market remain at about the following levels:

Pitch nominal; creosote about 5d.; refined tar 3¾d. to 4d.; pure toluene under the Ministry of Supply Toluene No. 2 Order 2s. 5d.; pure benzole 1s. 10d.; 95/160 solvent naphtha 2s. 5d. to 2s. 8d., and 90/160 pyridine 13s. 6d.; all per gallon naked; refined crystal naphthalene £23 per ton in bags. All prices are *ex* Makers' Works.

### The Provinces

Oct. 13.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 1s. 10d. (controlled by the Control of Toluene No. 2 Order, July 5, which fixes the maximum price at which this material may be sold). Coal tar, crude naphtha, in bulk, North, 11d. to 1s. Solvent naphtha, naked, North, 1s. 9d. to 1s. 10d. Heavy naphtha, North, 1s. 9d. to 1s. 10d. Creosote, *ex* works, in bulk, North, liquid and salty, 4½d. to 4¾d.; Scotland, 4½d. to 4¾d.; low gravity, 4½d. to 4¾d. Fuel Grade, 4d. to 4¼d. Carbolic acid, 60's, 3s. 7½d. to 3s. 9d. Naphthalene, £15 to £20. Salts, drained, £6 to £6 10s.; whizzed 72°, £7 15s.; 78°, £9 5s. Anthracene prices fixed by Controller. Heavy oil: Unfiltered anthracene oil (min. gr. 1,080), 6d. to 6½d.; filtered heavy oil (min. gr. 1,080), 6½d. to 7d.; heavy anthracene oil gr. less than 1,080, 5¾d. to 6d.

*In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10.

### Tar Products in Scotland

GLASGOW, Oct. 11.

Deliveries are proceeding at a steady pace and prices of uncontrolled products continue strong.

**Refined tar** continues in good call at 4¾d. to 5d. per gallon for delivery in the home market, and about 3½d. per gallon for export, both f.o.r. naked.

**Creosote oil** is well looked after locally at the following prices: Specification oil 5¾d. to 6d. per gallon; low gravity, 6½d. to 7d. per gallon; neutral oil, 6d. to 6½d. per gallon; all *ex* Works in bulk.

**Cresylic acid:** Distillers are filling up the necessary forms under the new Control, and meantime supplies are still difficult to procure in the ordinary way. The following prices can only be taken as an indication: Pale, 99/100%, 4s. 4d. to 4s. 8d. per gallon; Pale, 97/99%, 4s. to 4s. 3d. per gallon; Dark, 97/99%, 3s. 9d. to 4s. per gallon; all *ex* Works in buyers' packages.

**Crude naphtha** is called 6½d. to 7½d. per gallon *ex* Works in bulk, according to quality.

**Solvent naphtha:** 90/160 grade is 1s. 8½d. to 1s. 9d. per gallon and 90/190 Heavy Naphtha is 1s. 4½d. to 1s. 5½d. per gallon.

**Pyridines** are still quiet at about 14s. per gallon for 90/160 grade and 16s. per gallon for 90/140 grade.

---

**At a Meeting of the Directors** of the Long Sutton and Sutton Gas Companies (Lincolnshire), it was decided that the two companies should amalgamate, and a formal resolution approving the amalgamation was passed. The new name is to be the Long Sutton and Sutton Bridge Gas Company, with the registered office at Long Sutton. The Board of Directors of the new Company is to include all Directors of the two companies.

# Gas Stocks and Shares

The Stock Markets opened the week on a firm note, but were speedily overshadowed by the uncertainty of the situation on the Russian front. Prices in most sections followed a downward course and the volume of business eased up. Though the gilt-edged market was quieter than of late quotations closed the week with little change. Old Consols opened with a rise, but eventually finished at the previous week's closing level of 82½. Home rails were also quiet and in the absence of buyers some small losses were recorded. Apart from some early activity in shipping shares, industrials were dull, though falls were not heavy. Oil shares weakened considerably on a reduction of speculative commitments, but rubber and tea shares were comparatively firm.

Despite the general position the number of recorded transactions in the Gas Market was heavier than during the previous week and, with few exceptions, prices remained firm. There was a good demand for Gas Light stocks and the units hardened 3d. to 13s. 9d. In view of the prices at which a number of the fixed-interest stocks changed hands some further increase in the present quotations appears justified.

The Directors of the South-Western Gas and Water Corporation have declared an interim dividend of 2% on the ordinary shares, the same rate as for the corresponding period of 1940, when 5% was paid for the full year.

The following is a complete list of price changes recorded during the week:

**OFFICIAL LIST**

| | | |
|---|---|---|
| Gas Light Units ... ... ... | 13/3—14/3 | +-/3d. |
| ,, 3½ p.c. max. ... ... | 45—50 | −2 |
| Imperial Continental Ord. ... ... | 62—67 | −1 |
| South Metropolitan Ord. ... ... | 51—56 | −1 |
| ,, ,, 3 p.c. Deb. ... | 70—75 | +2 |
| South Suburban 4 p.c. Pref. ... ... | 65—70 | +2 |
| United Kingdom Gas Corporation 3½ p.c. Deb. ... ... ... ... | 86—91 | +2 |
| Uxbridge Ord. ... ... ... ... | 85—90 | +2½ |

**PROVINCIAL EXCHANGES**

| | | |
|---|---|---|
| Bristol 5 p.c. max. ... ... ... | 92—94 | +2 |
| Sheffield Cons. ... ... ... ... | 111—113 | +1 |


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IN normal circumstances this space is occupied by information concerning the many Coal Tar and Ammonia Chemicals produced by the South Metropolitan Gas Company.

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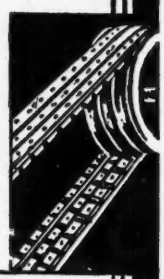

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